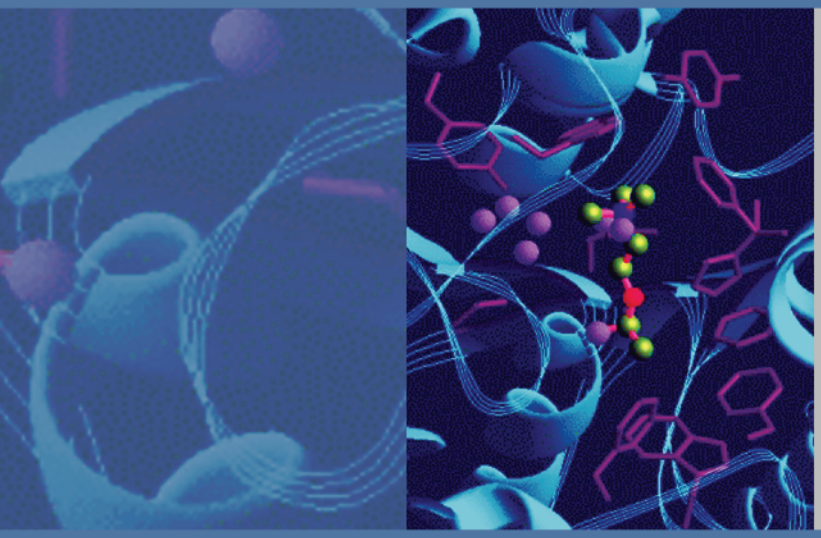

H-ESI Probe

User Guide

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Preface

This *H-ESI Probe User Guide* provides you with information on using the heated-electrospray ionization (H-ESI) probe. It also provides procedures for installing and maintaining the H-ESI probe.

CAUTION Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device.

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes.

Safety and special notices include the following:

CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

IMPORTANT Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

Note Highlights information of general interest.

Tip Highlights helpful information that can make a task easier.

Precautions for Handling the H-ESI Probe

When operating the mass spectrometer in the heated-electrospray mode, do **not** touch the heated surfaces of the H-ESI probe or the Ion Max API source housing. Touching the heated surfaces of the probe or the source housing can cause burns when the probe is operating at typical temperatures of 350 to 450 °C.

CAUTION AVOID BURNS. At typical operating temperatures (350 to 450 °C), the H-ESI probe and the API source housing can severely burn you. Before removing the probe from the API source housing, allow the probe to cool to room temperature (for approximately 20 minutes) before you touch it.

When operating the mass spectrometer in the heated-electrospray mode, if you observe liquid leaking from the sample inlet, place the mass spectrometer in Standby mode before you tighten the fitting to eliminate the leak.

CAUTION AVOID ELECTRIC SHOCK. Do not tighten the probe sample inlet fitting to eliminate a liquid leak while the mass spectrometer is in operation. If you touch liquid leaking from the probe sample inlet while the mass spectrometer is in operation, you might receive an electric shock.

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Phone	800-532-4752
Fax	561-688-8736
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Introduction

Heated-electrospray ionization (H-ESI) transforms ions in solution into ions in the gas phase by using electrospray ionization (ESI) in combination with heated auxiliary gas. H-ESI can be used to analyze any polar compound that makes a preformed ion in solution. The term *preformed ion* can include adduct ions. For example, polyethylene glycols can be analyzed from a solution containing ammonium acetate because of adduct formation between the NH_4^+ ions in the solution and oxygen atoms in the polymer.

This chapter describes the principles of H-ESI and the H-ESI probe. See Figure 1. The H-ESI probe is housed in the Ion Max™ ion source housing.

Figure 1. Ion source interface (left) and H-ESI probe (right)

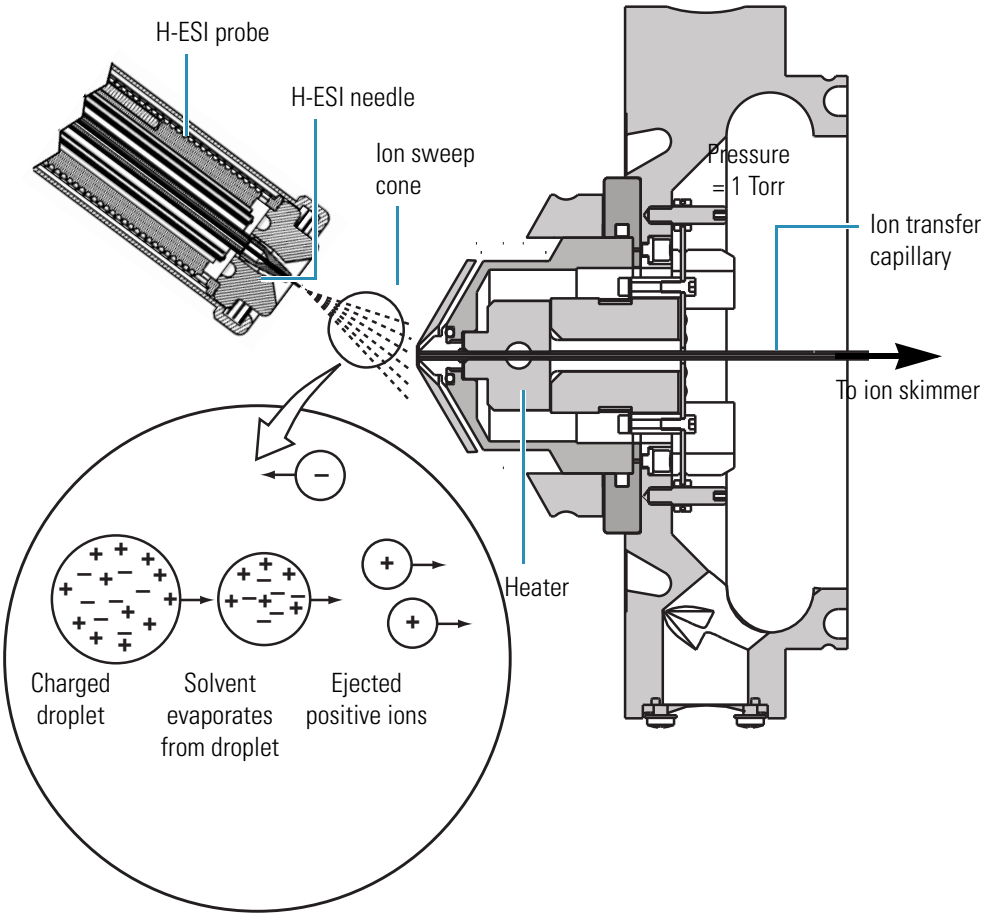
With H-ESI, a mass spectrometer can analyze a range of molecular weights greater than 100 000 u, due to multiple charging. H-ESI is especially useful for the mass analysis of polar compounds, which include biological polymers (for example, proteins, peptides, glycoproteins, and nucleotides); pharmaceuticals and their metabolites; and industrial polymers (for example, polyethylene glycols).

In H-ESI, ions are produced and analyzed as follows:

1. The sample solution enters the H-ESI needle, which receives a high voltage.
2. The H-ESI needle sprays the sample solution into a fine mist of droplets that are electrically charged at their surface.
3. The electrical charge density at the surface of the droplets increases as solvent evaporates from the droplets. In H-ESI, heated auxiliary gas aids solvent evaporation.
4. The electrical charge density at the surface of the droplets increases to a critical point known as the Rayleigh stability limit. At this critical point, the droplets divide into smaller droplets because the electrostatic repulsion is greater than the surface tension. The process is repeated many times to form very small droplets.
5. Electrostatic repulsion ejects sample ions from the very small, highly charged droplets into the gas phase.
6. The sample ions enter the mass spectrometer and are analyzed.

Figure 2 shows the steps in the formation of ions from highly charged droplets.

Figure 2. H-ESI process in the positive ion polarity mode



You can use the H-ESI mode in either positive or negative ion polarity mode. The ion polarity mode of choice is determined by the polarity of the preformed ions in solution: Acidic molecules form negative ions in solution, and basic molecules form positive ions. Use a positively charged needle to analyze positive ions and a negatively charged needle to analyze negative ions, as the ejection of sample ions from droplets is facilitated if the ionic charge and surface charge of the droplet have the same polarity.

Sample ions can carry a single charge or multiple charges. The number of charges carried by the sample ion depends on the structure of the analyte of interest and the carrier solvent. (In H-ESI, the buffer and the buffer strength both have a noticeable effect on sensitivity, so it is important to choose these variables correctly.) In the case of higher molecular weight proteins or peptides, the resulting mass spectrum consists typically of a series of peaks corresponding to a distribution of multiply charged analyte ions.

Droplet size, surface charge, liquid surface tension, solvent volatility, and ion solvation strength are factors that affect the H-ESI process. Large droplets with high surface tension, low volatility, strong ion solvation, low surface charge, and high conductivity prevent good electrospray.

Organic solvents, such as methanol, acetonitrile, and isopropyl alcohol, are superior to water for H-ESI. Volatile acids and bases are good, but salts above 10 mM concentration and strong acids and bases are extremely detrimental.

Follow these rules for achieving a good electrospray:

- Keep salts out of the solvent system.
- Use organic/aqueous solvent systems and volatile acids and bases.
- Optimize the pH of the solvent system.

Note You do not need to tune and calibrate the mass spectrometer as part of your daily routine.

Calibration parameters are instrument parameters that affect the mass accuracy and resolution. Tune parameters are instrument parameters that affect the intensity of the ion signal. You must tune and calibrate the mass spectrometer (that is, optimize the tune and calibration parameters) approximately once a quarter. Refer to the "Automatic Tuning and Calibrating in the H-ESI/MS Mode" chapter in your instrument's getting started manual for a procedure to tune and calibrate your mass spectrometer.

You must optimize the tune parameters (or change the Tune Method) whenever you change the type of experiment. Refer to the "Optimizing the Mass Spectrometer with Your Compound in H-ESI/MS Mode" chapter in your instrument's getting started manual for a procedure to optimize and tune the parameters for your H-ESI experiment.

Table 1 shows initial H-ESI settings for different liquid flow rates. These initial settings provide a starting point for optimizing system performance. The optimal settings for your application depend on the compounds of interest, the solvent matrix, and the chromatographic conditions. For information on optimizing these settings, refer to the getting started guide for your mass spectrometer.

For an LTQ Series mass spectrometer, the allowable range for the auxiliary gas flow depends on the version of the instrument control software and the vaporizer temperature setting:

- For LTQ 2.5.0 or lower, the allowable range for the auxiliary gas flow is 5 to 60 units.
- For LTQ 2.5.5 or higher, the allowable range for the auxiliary gas flow is 0 to 60 units for vaporizer temperatures up to 100.00 °C. For vaporizer temperatures above 100.00 °C, the minimum auxiliary gas flow is 5 units.

For a TSQ Series mass spectrometer, you can set the auxiliary gas flow from 0 to 60 units.

Tip For best results, set the auxiliary gas flow to a minimum of 5 units for vaporizer temperatures above 100.00 °C.

Table 1. Initial H-ESI settings for the H-ESI probe

Liquid flow rate (µL/min)	Ion transfer tube (capillary) temperature (°C)*	H-ESI vaporizer temperature (°C)**	Sheath gas pressure (psi)	Auxiliary gas flow (arbitrary units)	Spray voltage (V)
5	240	Off to 50	5	0***	+3000 (-2500)****
200	350	250 to 300	35	30	+3000 (-2500)
500	380	300 to 400	60	50	+3000 (-2500)
1000	400	350 to 450	75	60	+3000 (-2500)

* Always optimize the tube lens voltage whenever you change the temperature of the ion transfer tube.

** Compound dependent

***For an LTQ Series mass spectrometer controlled from LTQ 2.50 or lower, the minimum auxiliary gas flow setting is 5.

****Negative ion mode

Functional Description

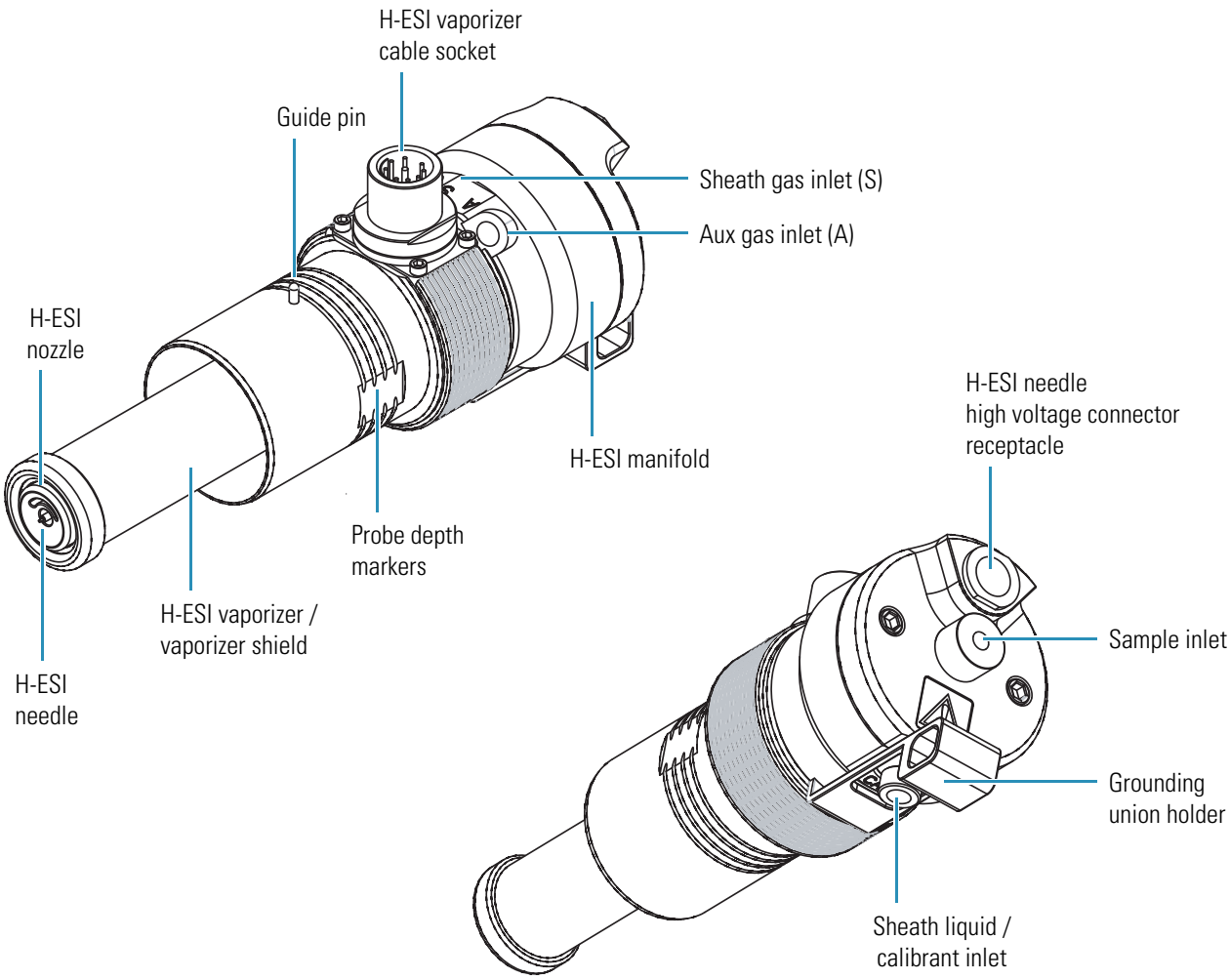
The H-ESI probe, shown in Figure 3, produces charged aerosol droplets that contain sample ions. The H-ESI probe accommodates liquid flows of 1 µL/min to 1 mL/min without splitting.

The H-ESI probe includes a fused-silica sample tube, needle, nozzle, manifold, vaporizer, and heat exchanger. Sample and solvent enter the H-ESI probe through the sample tube. The sample tube is a short section of 0.1-mm ID, fused-silica tubing that extends through the H-ESI probe and into the H-ESI needle to near the end of the H-ESI needle. A large negative or positive voltage is applied to the H-ESI needle (typically ±3 to ±5 kV), which sprays the sample solution into a fine mist of charged droplets. The H-ESI nozzle directs the flow of sheath gas and auxiliary gas at the droplets. The H-ESI manifold houses the H-ESI nozzle and needle, and includes the sheath gas and auxiliary gas plumbing. The sheath gas plumbing delivers dry nitrogen gas to spray the sample solution out the nozzle.

The H-ESI probe has inlets for the introduction of sample solution, sheath gas, auxiliary gas, and sheath liquid or calibrant into the H-ESI probe. The sheath gas is the inner coaxial nitrogen gas that sprays (nebulizes) the sample solution into a fine mist as it exits the sample tube. Typical sheath gas flow rates for H-ESI are 5 to 20 units for sample flow rates of less than 10 µL/min, and 50 to 75 units for sample flow rates greater than 400 µL/min. When you tune the mass spectrometer, for best results adjust the sheath gas flow rate until the ion signal is stable.

The heated auxiliary gas is the outer coaxial nitrogen gas that assists the sheath gas in the desolvation of sample solutions. The auxiliary gas heats as it spirals through a vaporizer. The vaporizer is thermally insulated from the sample tube to prevent direct heating of the sample solution. You can control the temperature of the vaporizer in the Xcalibur™ data system. The temperature range is from room temperature to 600 °C. For recommended operating temperatures and gas flow settings, see Table 1 on page 4.

Figure 3. H-ESI probe



To enhance desolvation or to improve the stability of the electrospray, you can infuse sheath liquid directly from the syringe pump into the H-ESI probe via the sheath liquid/calibrant inlet (labeled CAL). You can also infuse internal calibrants into the H-ESI probe.

The angle of the H-ESI probe is fixed at approximately 60 degrees. To help optimize the spray stability, use adjustment screws on the Ion Max source housing to make small changes to probe position. The fixed angle, off-axis spraying affords long-term signal stability (robustness) for most solutions that contain non-volatile matrix components, mobile phase buffers, or ion-pairing reagents. For information on adjusting the probe position, refer to the *Ion Max and Ion Max-S API Source Hardware Manual*.

Removing and Installing the H-ESI Probe

This chapter describes how to remove and install the H-ESI probe from the Ion Max source housing. You must remove the H-ESI probe to change ionization modes and to perform maintenance on the probe. You do not need to remove the Ion Max source housing to change probes.

Note To remove or install an APCI or ESI probe, refer to the *Ion Max and Ion Max-S API Source Hardware Manual*.

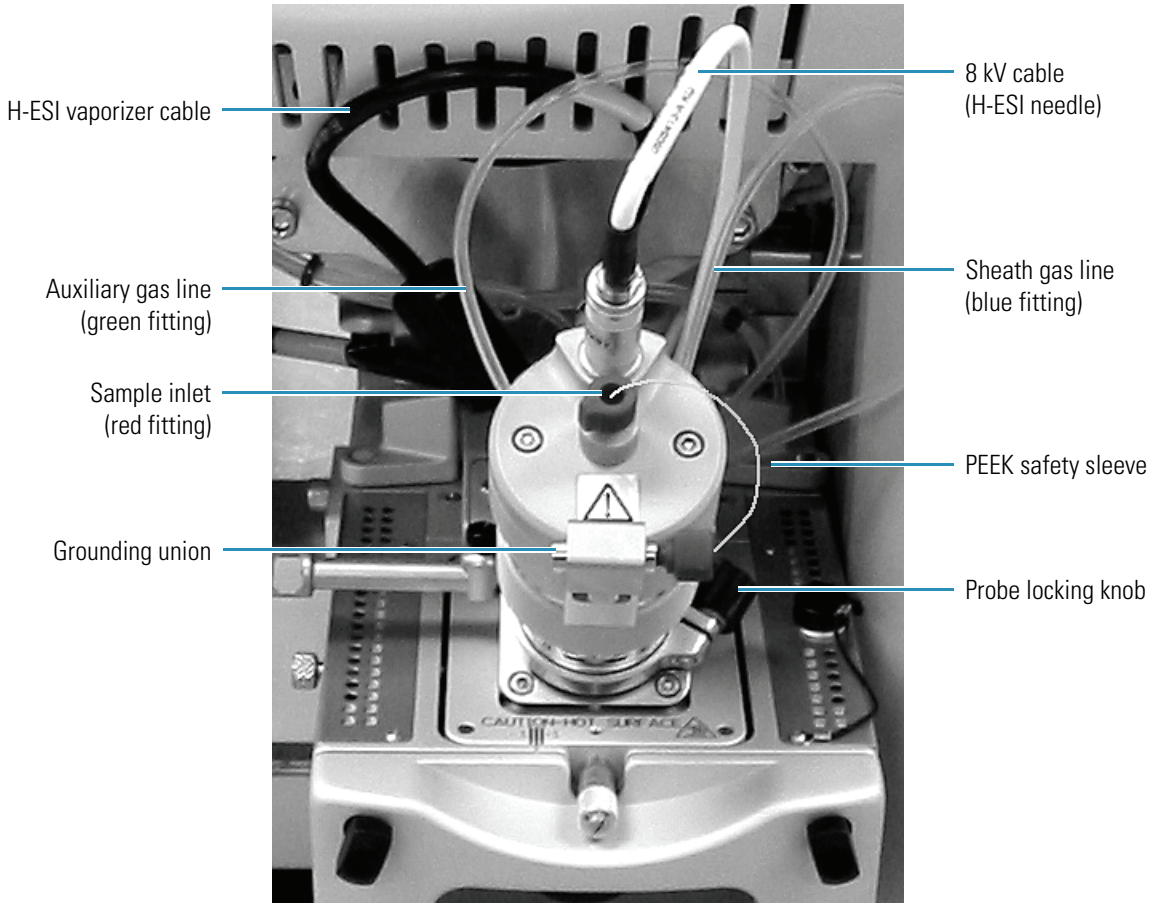
Removing the H-ESI Probe

CAUTION AVOID BURNS. At operating temperatures, the H-ESI vaporizer can severely burn you. The H-ESI vaporizer typically operates between 350 and 450 °C. **Always allow the heated vaporizer to cool to room temperature (for approximately 20 min) before you remove or touch the H-ESI probe**.

❖ To remove the H-ESI probe

1. Place your mass spectrometer in standby.
2. Disconnect the sample transfer tubing (LC line) from the grounding union (stainless steel ZDV fitting).
3. Disconnect the 8 kV cable from the H-ESI needle high voltage receptacle as follows (see Figure 4):
   a. Unlock the cable by twisting the locking ring counterclockwise.
   b. Unplug the 8 kV cable from the H-ESI needle high voltage receptacle.
4. Unplug the H-ESI vaporizer cable from the cable socket on the H-ESI probe. See Figure 4.
5. Connect the H-ESI vaporizer cable to the ESI interlock socket on the ion source housing. See Figure 5.
6. Disconnect the auxiliary gas fitting (green) from the auxiliary gas inlet (A) on the probe manifold. See Figure 4.
7. Disconnect the sheath gas fitting (blue) from the sheath gas inlet (S) on the probe manifold.

Figure 4. H-ESI probe installed on the Ion Max housing



8. Unlock the probe locking ring by turning the probe locking knob counterclockwise.
9. Carefully pull the probe straight back in the port in the housing until it meets with the slot in the ESI interlock block. The guide pin on the probe manifold prevents you from twisting the probe until the pin is aligned with the slot in the ESI interlock block. Once the probe is all the way back and aligned with the slot, turn the probe 45 degrees counterclockwise to free the probe from the alignment notch. Be careful not to break the fused-silica sample tube or PEEK™ safety sleeve.
10. Pull the probe straight out to remove it from the ion source housing.
11. Store the H-ESI probe in its original shipping container.

Installing the H-ESI Probe

Note To remove an APCI or ESI probe, refer to the *Ion Max and Ion Max-S API Source Hardware Manual*.

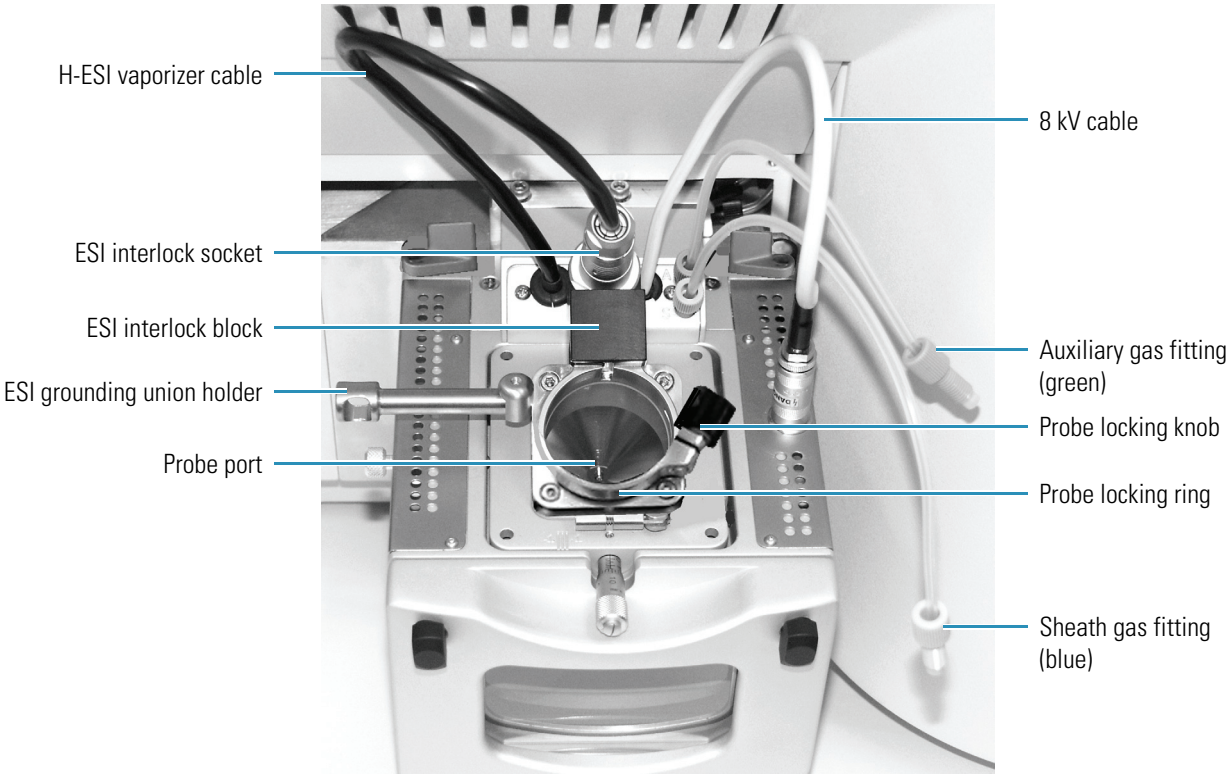
❖ To install the H-ESI probe

1. Remove the H-ESI probe from its storage container. Inspect and clean it if necessary.

   Note If your H-ESI probe does not already have a sample tube (fused-silica capillary) and safety sleeve attached, you must follow the procedure for installing a sample tube and PEEK safety sleeve in the topic "Installing a New Fused-Silica Sample Tube and PEEK Safety Sleeve" on page 16.

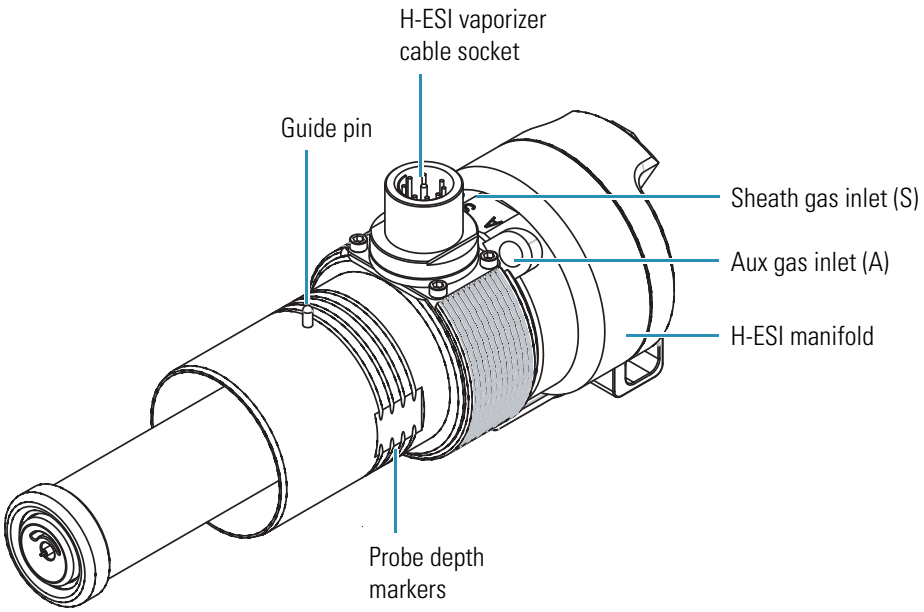
2. Ensure that the probe locking ring is opened to its widest position. See Figure 5.

Figure 5. Ion Max ion source housing without H-ESI probe



3. Insert the H-ESI probe into the port in the ion source housing. Make sure to align the guide pin on the probe body (see Figure 6) at a minus 45° angle from the ESI interlock block (see Figure 5).

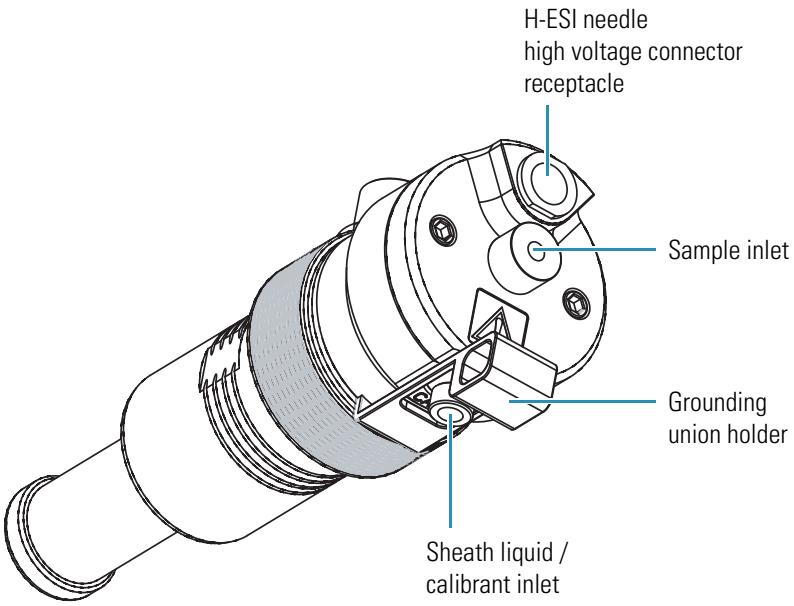
Figure 6. H-ESI probe, front view



4. Push the probe into the port until the guide pin meets with the locking ring on the ion source housing. See Figure 5.
5. Turn the probe 45 degrees clockwise and align the guide pin with the slot in the ESI interlock block; you might have to pull the probe towards you slightly to properly align the pin with the notch. Once you have turned the probe far enough to align the pin with the alignment notch at the rear of the port, push the probe straight in until the guide pin stops at the bottom of the alignment notch.
6. Lock the probe in place by turning the probe locking knob clockwise. See Figure 5.
7. Ensure that the grounding union (stainless steel ZDV fitting) is seated in the grounding union holder on the H-ESI probe. See Figure 7.

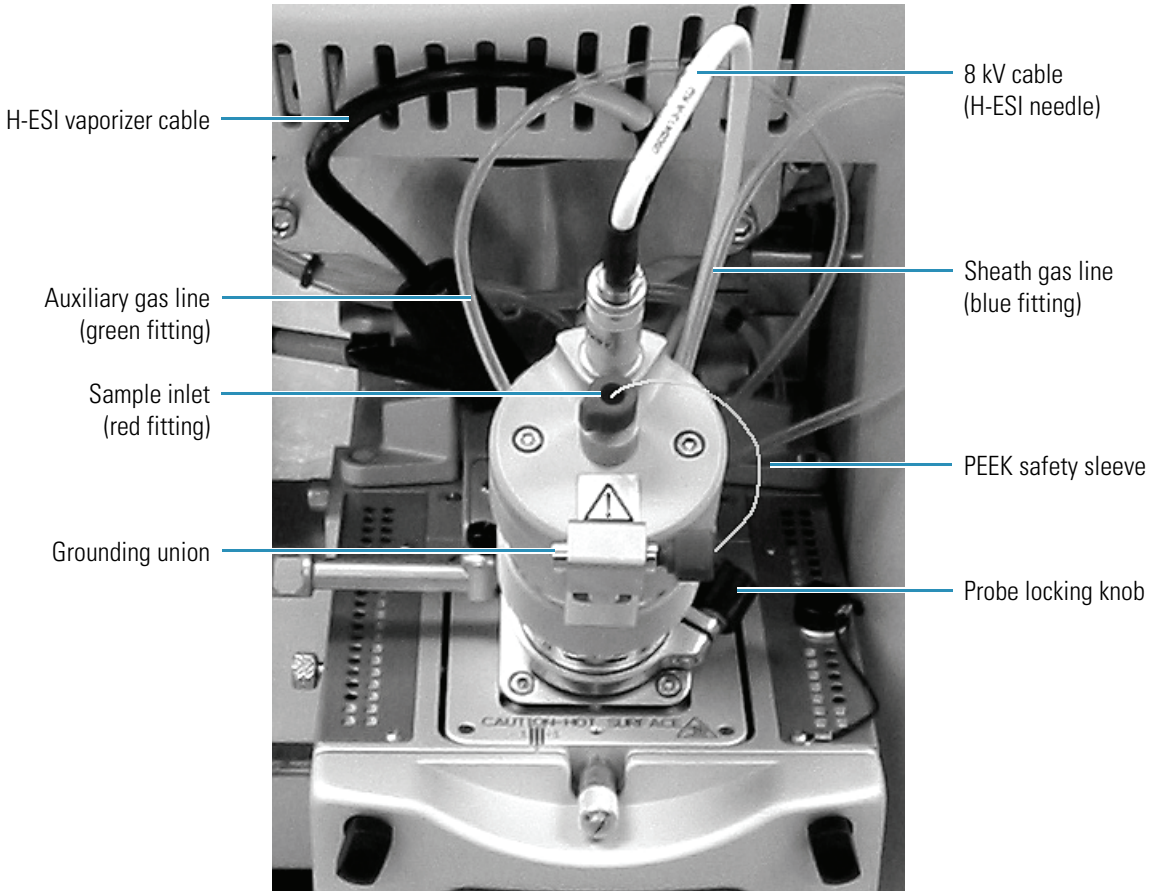
CAUTION To avoid electric shock, ensure that the grounding union is seated in the grounding union holder on the H-ESI probe. If the grounding union is not seated and you touch the fused-silica solvent line while the system is in operation, you might receive an electric shock.

Figure 7. H-ESI probe, rear view



8. Connect the sheath gas fitting (blue) to the sheath gas inlet (S) on the probe manifold. See Figure 6.
9. Connect the auxiliary gas fitting (green) to the auxiliary gas inlet (A) on the probe manifold. See Figure 6.
10. Unplug the H-ESI vaporizer cable from the ESI interlock socket.
11. Connect the H-ESI vaporizer cable to the vaporizer cable socket on the H-ESI probe. See Figure 6.
12. Connect the 8 kV cable to the H-ESI needle high voltage receptacle on the H-ESI probe. See Figure 7. Tighten the locking ring on the 8 kV connector.
13. Connect the sample transfer tubing (LC line) to the grounding union. See Figure 8.

Figure 8. H-ESI probe installed in the Ion Max housing



The H-ESI source is now properly installed on the mass spectrometer.

Tip Before you analyze samples with the H-ESI source, you must change to H-ESI source mode in Quantum Tune Master by choosing **Setup > Change Ion Source > HESI**.

Maintenance

The H-ESI probe requires minimum maintenance. If the fused-silica sample tube is plugged or broken, you must replace it. Although you can trim or replace the sample tube without disassembling the H-ESI probe, to replace the H-ESI needle or needle seal, you must partially disassemble the H-ESI probe.

Tip For best results, flush the H-ESI probe at the end of each working day, using a 50:50 LCMS-grade methanol\distilled water solution from the LC through the H-ESI probe.

Wear clean gloves when you handle H-ESI probe components.

CAUTION AVOID BURNS. At operating temperatures, the H-ESI vaporizer can severely burn you. The H-ESI vaporizer typically operates between 350 and 450 °C. Always allow the heated vaporizer to cool to room temperature (for approximately 20 min) before you remove or touch the H-ESI probe.

Contents

- Flushing the Sample Transfer Line, Sample Tube, and H-ESI Probe
- Trimming the H-ESI Sample Tube
- Replacing the H-ESI Needle and Needle Seal
- Installing a New Fused-Silica Sample Tube and PEEK Safety Sleeve

Flushing the Sample Transfer Line, Sample Tube, and H-ESI Probe

For best results flush the sample transfer line, sample tube, and H-ESI probe for 15 minutes at the end of each working day (or more often if you suspect they are contaminated). Use a 50:50 methanol\distilled water solution from the LC through the API source. After 15 minutes, turn off the flow of liquid from the LC to the API source, but keep the API source on (including the sheath gas and auxiliary gas) for an additional 5 minutes. Refer to the daily operations chapter in your mass spectrometer's hardware manual.

Trimming the H-ESI Sample Tube

Operating your instrument with acetonitrile in the mobile phase can cause the polyimide coating on the fused-silica sample tube to elongate. If the polyimide coating has elongated past the end of the H-ESI needle, you must cut and reposition the end of the sample tube.

❖ **To cut and reposition the end of the sample tube approximately 0.5 mm (between 0 and 1 mm) inside the end of the H-ESI needle**

1. Remove the H-ESI probe from the Ion Max source by following the procedure in the topic "Removing the H-ESI Probe" on page 7.
2. Loosen the sample inlet fitting.
3. Gently pull back on the sample tube to free it from the fitting.
4. Push the sample tube forward so that it extends beyond the end of the H-ESI needle.
5. Use a fused-silica cutting tool to cut off a small length of sample tube. Ensure that you cut the end of the sample tube squarely.
6. Pull the sample tube backwards until the exit end of the sample tube is recessed just inside the H-ESI needle by approximately 0.5 mm (between 0 and 1 mm).
7. Tighten the sample inlet fitting securely to hold the sample tube.

   Note The sample tube might move forward when you tighten the sample inlet fitting. Ensure that the sample tube is retracted into the H-ESI needle approximately 0.5 mm (between 0 and 1 mm). If necessary, loosen the fitting and reposition the sample tube.

8. Reinstall the H-ESI probe as described in the topic "Installing the H-ESI Probe" on page 9.

Replacing the H-ESI Needle and Needle Seal

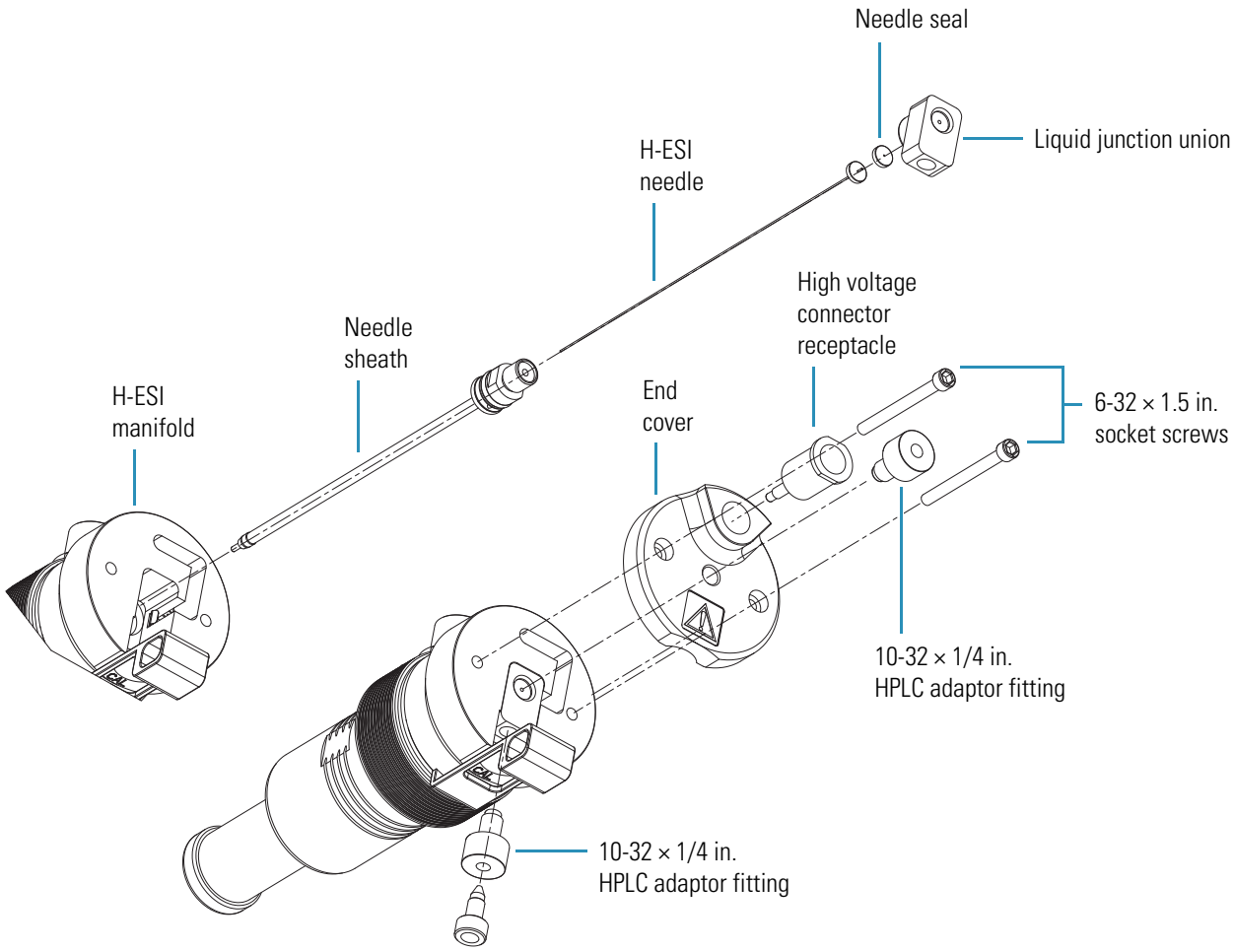
You must replace the H-ESI needle if it is damaged. You need to replace the needle seal if the sheath gas is leaking at the needle seal-needle interface. If you replace the needle, you should also replace the needle seal.

❖ **To replace the needle and/or needle seal (see Figure 9)**

1. Remove the H-ESI probe from the Ion Max source by following the procedure in the topic "Removing the H-ESI Probe" on page 7.
2. Unscrew the sample inlet fitting.
3. Remove the sample tube and sample inlet fitting from the H-ESI probe.
4. Use a 7/64 in. hex wrench or ball driver to remove the two 6-32 × 1/4 in. socket screws.
5. Remove the end cover from the H-ESI manifold.

6. Unscrew and remove the sheath liquid/calibrant fitting.
7. Remove the liquid junction union, needle, needle seal, and needle sheath from the H-ESI manifold as a unit. See Figure 9.
8. While grasping the liquid junction union with a 1/2 in. open end wrench, use a 3/8 in. open end wrench to unscrew the needle sheath from the liquid junction union.
9. Remove the H-ESI needle and needle seal from the needle sheath.
10. Remove the needle seal from the H-ESI needle.
11. Inspect the Teflon™ needle seal (P/N 97055-20271). If the needle seal is deformed, replace it.
12. Inspect the 26-gauge H-ESI needle (P/N 97055-20273). If the H-ESI needle is damaged, replace it. If you replace the needle, you should also replace the needle seal.
13. Reinstall the H-ESI probe as described in the topic "Installing the H-ESI Probe" on page 9.

Figure 9. H-ESI probe (exploded view)



❖ **To reassemble the H-ESI probe (see Figure 9)**

1. Insert the entrance end of the H-ESI needle into the needle seal.
2. Reassemble the needle sheath, H-ESI needle and seal, and liquid union junction unit as follows:
   a. Seat the H-ESI needle and needle seal in the needle sheath.
   b. Thread the needle sheath into the liquid junction union. Slightly wet the needle sheath threads with HPLC-grade methanol for lubrication.
   c. With a 3/8 in. wrench, gently tighten the needle sheath until it is a little more than fingertight. Do not overtighten the needle sheath.
3. Insert the needle sheath, H-ESI needle and seal, and liquid union junction unit into the H-ESI manifold.
4. Insert the sheath liquid/calibrant adaptor into the H-ESI manifold and tighten until fingertight.
5. Position the end cover on the H-ESI manifold.
6. Insert the two 6-32 × 1/4 in. socket screws into the H-ESI probe and tighten them with a 7/64 in. hex wrench or ball driver.
7. Carefully insert the fused-silica sample tube into the H-ESI probe.
8. Tighten the sample inlet fitting.
9. Reinstall the H-ESI probe as described in the topic "Installing the H-ESI Probe" on page 9.

Installing a New Fused-Silica Sample Tube and PEEK Safety Sleeve

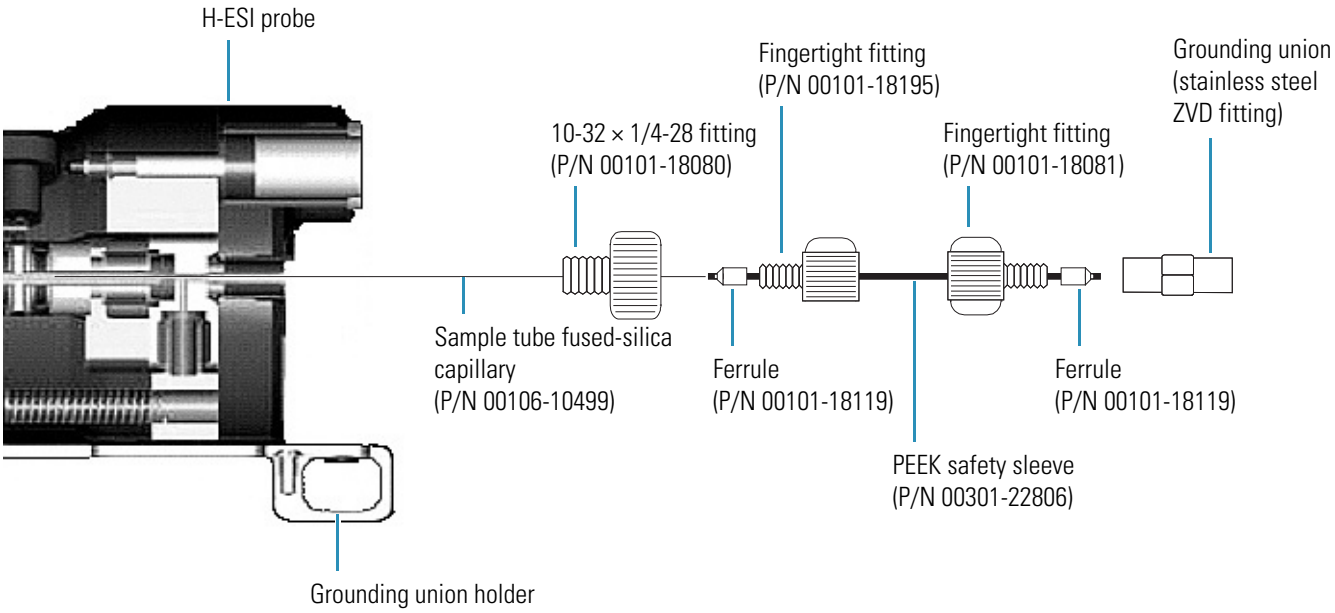
❖ **To install a new sample tube and PEEK safety sleeve**

CAUTION AVOID ELECTRICAL SHOCK. When you are operating your instrument in the H-ESI mode, you could receive an electrical shock unless you install the safety kit discussed below. You could receive an electrical shock if the fused-silica capillary tube breaks during H-ESI operation. Therefore, for your safety and in compliance with international safety standards, you **must** cover the fused-silica capillary tube with the PEEK safety sleeve (P/N 00301-22806) and associated PEEK ferrules (P/N 00101-18119) provided in the Safety Sleeve Kit (P/N 70005-62015) before you operate the instrument. Installation instructions (P/N 70005-97009) are included in the kit. Operation of the instrument without the safety sleeve impairs the safety protection provided by the instrument and, thus, could lead to serious injury.

1. Remove the H-ESI probe from the Ion Max source by following the procedure in the topic "Removing the H-ESI Probe" on page 7.

2. Use a fused-silica cutting tool to cut a 30 cm (12 in.) piece of 0.1 mm ID × 0.19 mm OD, fused-silica tubing (sample tube) (P/N 00106-10499). Ensure that you cut the ends of the fused-silica tubing squarely.
3. Insert the sample tube through the exit end of the H-ESI needle and into the H-ESI probe.
4. Push the sample tube through the H-ESI probe until approximately 3.5 cm (1.5 in.) is left protruding from the exit end of the H-ESI needle. The remaining length of sample tube should exit the H-ESI probe sample inlet.
5. Slide the 10-32 × 1/4-28 Kel-F™ fitting adaptor (P/N 00101-18080) over the sample tube (see Figure 10) and tighten the fitting onto the H-ESI probe sample inlet.

Figure 10. Fused-silica sample tube and safety sleeve assembly

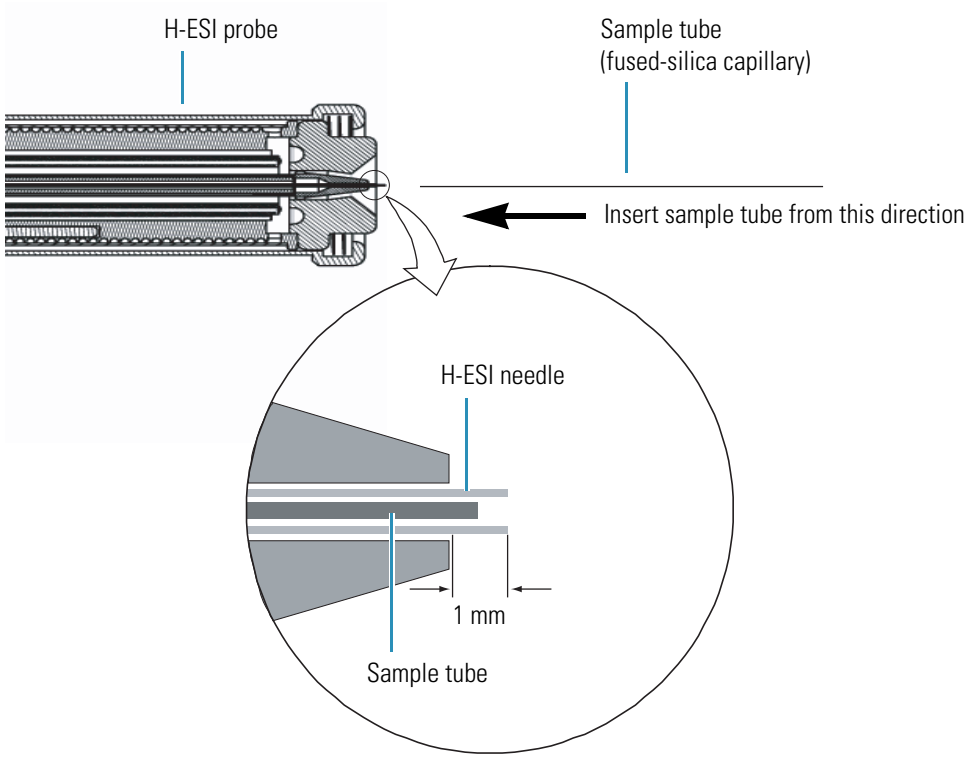


6. Slide the precut 25 cm (10 in.) 0.009 in. ID × 0.024 in. OD PEEK safety sleeve (P/N 00301-22806) over the sample tube.
7. Slide the 0.027 in. ID PEEK ferrule (P/N 00101-18119), narrow end first, over the PEEK safety sleeve and to the 10-32 × 1/4-28 Kel-F fitting adaptor.
8. Slide the (red) Fingertight fitting (P/N 00101-18195) onto the PEEK safety sleeve and into the H-ESI probe sample inlet (labeled *Sample*). Tighten the fitting slightly, but not completely.
9. Push the PEEK safety sleeve over the sample tube until it stops against the Teflon needle seal inside the H-ESI probe.
10. Pull the sample tube (from the H-ESI needle end) until the sample tube is flush with the precut square end of the PEEK safety sleeve.

11. Slide a (brown) Fingertight fitting (P/N 00101-18081) and (brown) ferrule (P/N 00101-18119), wide end first, over the PEEK safety sleeve.
12. Connect the PEEK safety sleeve and the ferrule to the (stainless steel) ZDV fitting by tightening the (brown) Fingertight fitting. Ensure that the Fingertight fitting is securely tightened around the PEEK safety sleeve; otherwise, the sample stream might enter between the sample tube and the PEEK safety sleeve. Ensure the sample tube is held tightly in the grounded fitting by gently pulling the sample tube from the exit end of the H-ESI needle.
13. Use a fused-silica cutting tool to cut the sample tube at the H-ESI needle so that only 2.5 cm (1 in.) remains protruding from the exit end of the H-ESI needle.
14. From the sample inlet pull the PEEK safety sleeve backwards, so that the exit end of the sample tube is recessed just inside the H-ESI needle by approximately 0.5 mm (between 0 and 1 mm). See Figure 11.
15. Tighten the (red) Fingertight fitting securely to hold the PEEK safety sleeve and sample tube in place.

Note The sample tube might move forward when you tighten the sample inlet fitting. Ensure that the sample tube is retracted into the H-ESI needle approximately 0.5 mm (between 0 and 1 mm). If necessary, loosen the fitting and reposition the sample tube.

Figure 11. Installing the fused-silica sample tube



Replaceable Parts

This chapter contains part numbers for replaceable and consumable parts for the H-ESI probe. To ensure proper results in servicing the H-ESI probe, order only the parts listed or their equivalent.

This chapter contains part numbers for the following items:

Probe, H-ESI 97055-60140
- Needle, metal, 26-gauge, H-ESI 97055-20273
- Seal, needle 97055-20271
- Tubing, fused-silica, 0.10 mm ID × 0.19 mm OD 00106-10499
- Fitting, grounding union, ZDV, 1/4-28 00109-00304
- Ferrule, 0.008 in. ID, KEL-F, HPLC 00101-18075
- Fitting, plug, 1/4-28, TEFZEL™, HPLC 00101-18075
- Ferrule, 0.012 in.ID, KEL-F, HPLC 00101-18116

Safety Sleeve Kit. 70005-62015
- Ferrule 0.027 in. ID PEEK HPLC 00101-18119
- Safety sleeve 0.009 in. ID × 024 in. OD × 10 in. length, natural PEEK 00301-22806
- Instructions safety sleeve 70005-97009
- Fitting, Fingertight Upchurch 00101-18195
- Fitting, Fingertight, HPLC, 10-32, PEEK 00101-18081
- Fitting, adaptor, 10-32 × 1/4-28, KEL-F 00101-18080

For information on ordering LCMS-grade solvents from Thermo Fisher Scientific, go to www.FisherLCMS.com.

Figure 12. Consumables for the H-ESI probe

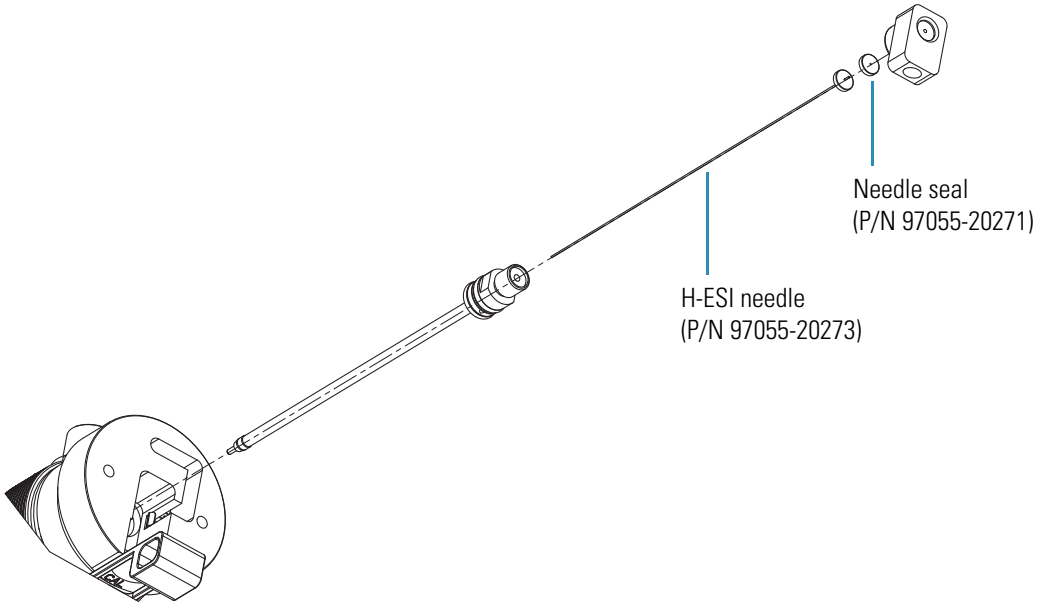
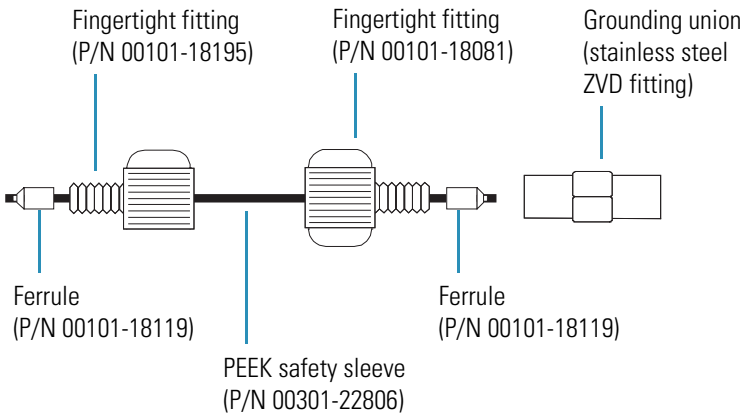


Figure 13. PEEK safety sleeve part numbers



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